

Project Title

Use Of Wearables for Remote Cancer Rehabilitation

Project Lead and Members

- Ms Ng Xinyi
- Ms Aw Hui Zhen

Organisation(s) Involved

Singapore Cancer Society Rehabilitation Centre

Healthcare Family Group(s) Involved in this Project

Medical, Allied Health

Applicable Specialty or Discipline

Oncology, Rehabilitative Therapy

Project Period

Start date: Not Available

Completed date: Not Available

Aim(s)

Aim of this study was to investigate the feasibility of using an enhanced version of wearable for breast cancer patients under Singapore Cancer Society Rehabilitation Centre (SCSRC) as an adjunct for their shoulder rehabilitation recovery.

Background

See poster appended/ below

Methods

See poster appended/ below

Results

See poster appended/ below

Conclusion

See poster appended/ below

Project Category

Technology

Digital Health, Sensors, Wearables

Keywords

Shoulder Rehabilitation, Remote Supervision, Breast Cancer Survivorship

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Use of wearable as an adjunct for breast cancer patients in managing shoulder pain

XY Ng, HZ Aw

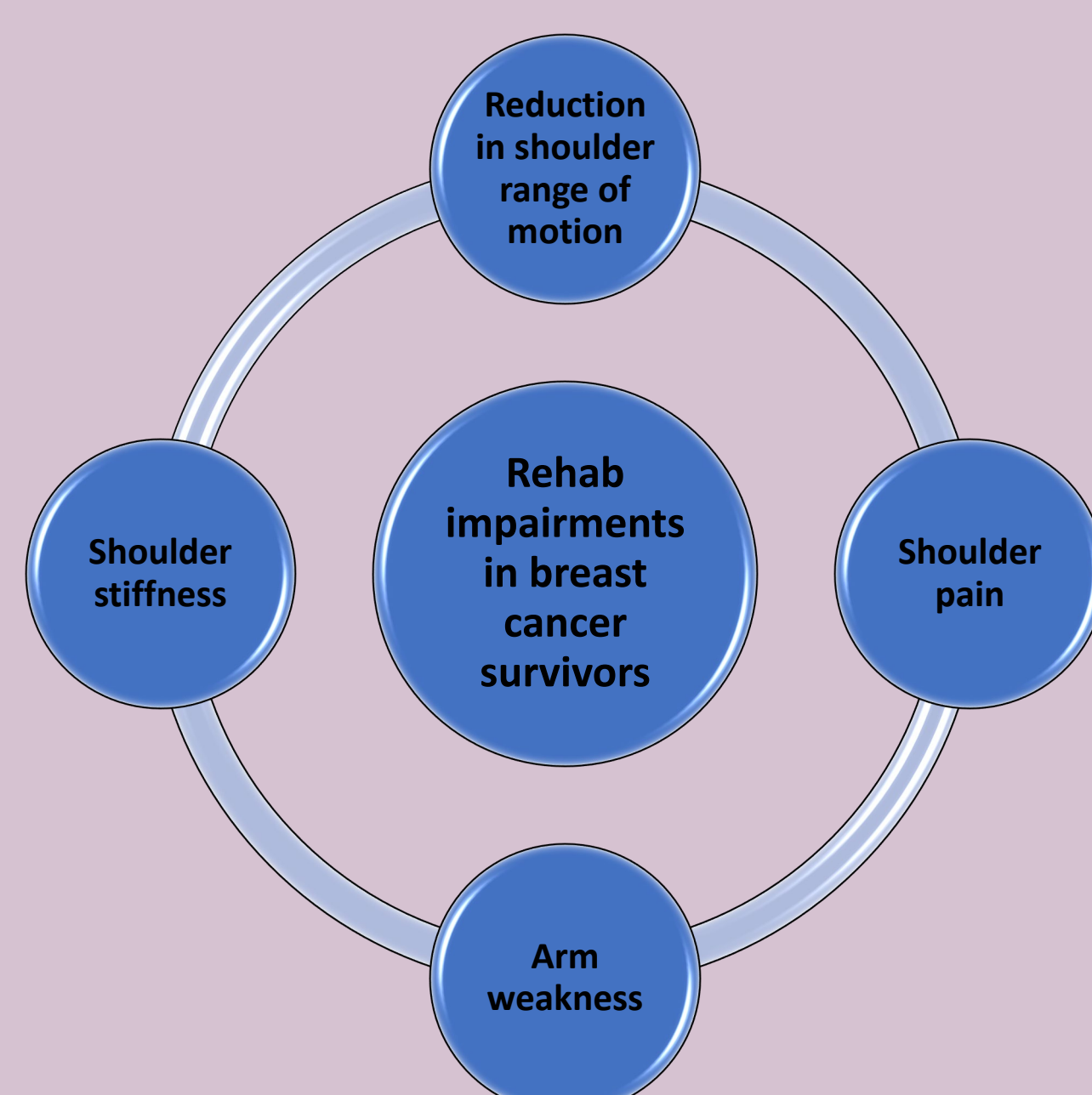
Cancer Rehabilitation Services, Singapore Cancer Society

Objectives

Wearables¹ are gaining more influence in the rehabilitation field to aid patients with neurological or musculoskeletal impairments. Several studies cited the growing potential of wearable for patients to independently perform exercises at home. However, lack² of follow up by physiotherapist and progression of exercises limit capability of wearables.

In Singapore, breast cancer is the most common cancer in the female population. Common causes of cancer related side effects for breast cancer survivors include shoulder dysfunction such as pain, reduction in shoulder range of motion and arm weakness. If left untreated, it may lead to severe disabilities impacting quality of life.

The primary aim of this study was to investigate the feasibility of using an enhanced version of wearable for breast cancer patients under Singapore Cancer Society Rehabilitation Centre (SCSRC) as an adjunct for their shoulder rehabilitation recovery.



Patients and Methods

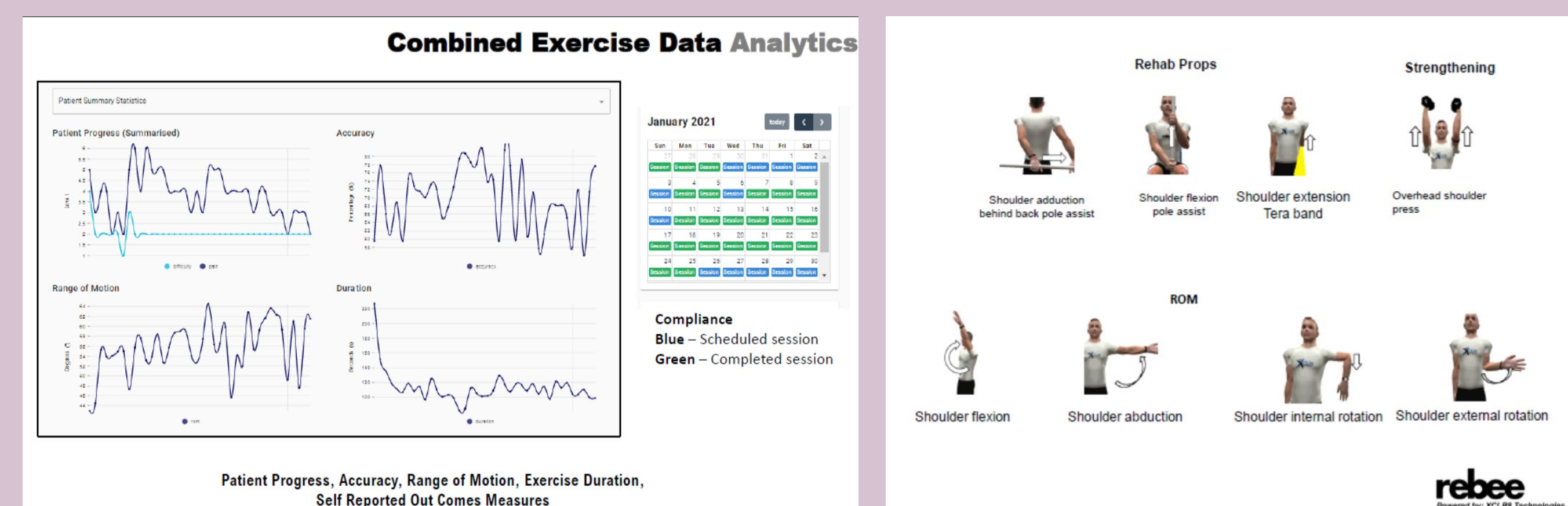
Seventeen breast cancer survivors with a mean age of 54 years old (44-78 years old) using the cancer rehabilitation services at the SCSRC were enrolled into a 12-week shoulder rehabilitation program.

The intervention consists of once-monthly, face-to-face physiotherapy session coupled with an individualised wearable (provided by XCRL8³) tagged with customised exercise application readily accessible from patient's smart phone. Patients are given unique log-in IDs to gain entry to their shoulder mobility and strengthening exercises prescribed offsite by their physiotherapist after initial physical consultation.

The patients were measured at baseline and at the end of 12th week for changes in outcome, including shoulder pain rating scale (0 to 10; 0 = no pain ; 10 severe pain), shoulder range of motion and self reported questionnaire on shoulder disability – QuickDASH⁴

Enhanced version of wearable

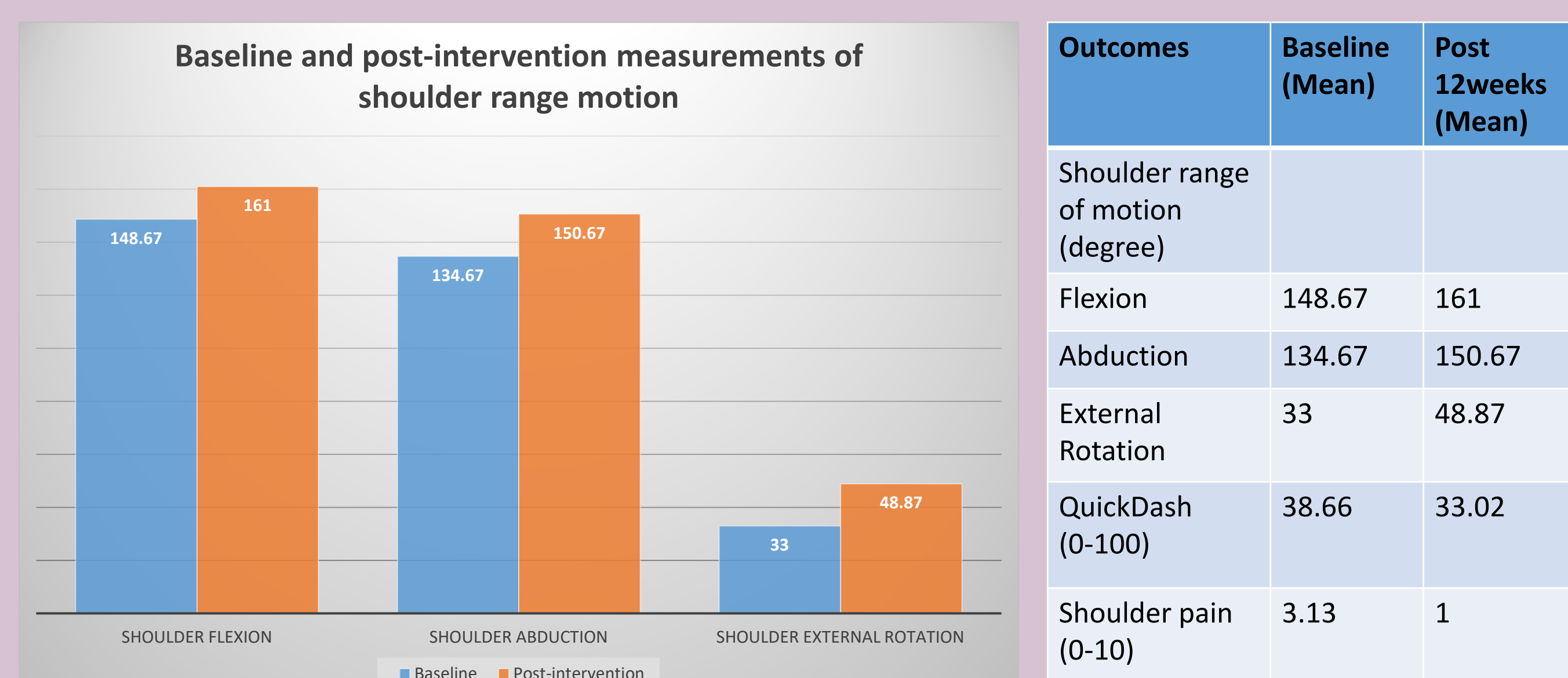
- Allows physiotherapist to remotely track patient's shoulder progression, home exercise attendances and modify exercises accordingly
- Exercise application is easily accessible using patient's personal phone or tablet with unique log-in ID



Results

Characteristics	
Female, n (%)	17 (100%)
Age (range)	54 (44-78)
Race	
Chinese, n (%)	10 (59%)
Malay, n (%)	4 (24%)
Indian and others, n (%)	3 (17%)
Surgery, n (%)	16 (94%)
Chemotherapy, n (%)	11 (65%)
Hormonal Therapy, n (%)	13 (76%)
Radiotherapy, n (%)	12 (71%)

All selected breast cancer survivors completed the 12-week programs. There are statistical (paired t-test) significant improvements ($p < 0.05$) in shoulder range of motion (flexion, abduction, external rotation) and pain score at the end of 12th weeks.

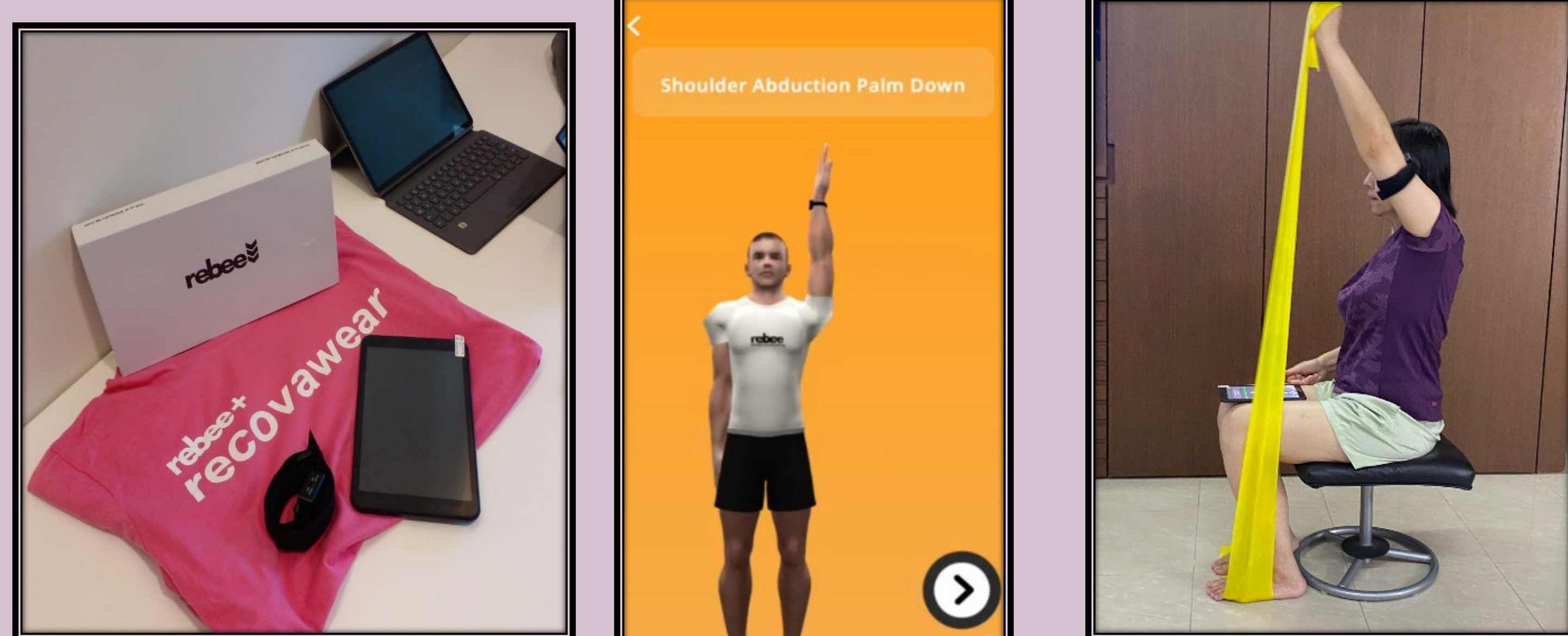


A modest reduction in patient self perceived shoulder disability on QuickDASH questionnaire.

Conclusion

Our pilot study indicate breast cancer survivors would benefit from remote supervision by physiotherapist through translated enhancement in wearable and customised exercise application. Significant improvements are seen in shoulder range of motion and pain score with once-monthly physical consultation. Thus, a careful assessment and individualized tailoring of an exercise prescription will result in physical empowerment and improved self-efficacy; this may eventually reset the health economics in the overall spectrum of breast cancer survivorship journey.

Cancer Patient Using Wearable & Customized Exercises via app



References

1. Chen, Y.-P., Lin, C.-Y., Tsai, M.-J., Chuang, T.-Y., & Lee, O. K.-S. (2020). Wearable motion sensor device to facilitate rehabilitation in patients with shoulder adhesive capsulitis: Pilot study to assess feasibility. *Journal of Medical Internet Research*, 22(7). <https://doi.org/10.2196/17032>
2. Rhodes, R. E., & Fiala, B. (2009). Building motivation and sustainability into the prescription and recommendations for physical activity and exercise therapy: The evidence. *Physiotherapy Theory and Practice*, 25(5-6), 424-441. <https://doi.org/10.1080/09593980902835344>
3. XCLR8 Remote Rehabilitation. (n.d.). XCLR8 Remote Rehabilitation. <http://www.xcl-r8.com/>
4. DASH Outcome Measure. (n.d.). Physiopedia. https://www.physio-pedia.com/DASH_Outcome_Measure
5. Cui, J., Yeh, S.-C., & Lee, S.-H. (2019). Wearable sensors integrated with virtual reality: A self-guided healthcare system measuring shoulder joint mobility for Frozen Shoulder. *Journal of Healthcare Engineering*, 2019, 1-6. <https://doi.org/10.1155/2019/7681237>
6. Chen, Y.-P., Lin, C.-Y., Tsai, M.-J., Chuang, T.-Y., & Lee, O. K.-S. (2020). Wearable motion sensor device to facilitate rehabilitation in patients with shoulder adhesive capsulitis: Pilot study to assess feasibility. *Journal of Medical Internet Research*, 22(7). <https://doi.org/10.2196/17032>
7. Mackenzie, S. P., McLean, M., Spasojevic, M., Niu, R., Kruse, L., Gwynne, J., Young, A., & Cass, B. (2022). Wrist-mounted accelerometers provide objective evidence of disease and recovery in patients with frozen shoulder. *JSES International*, 6(1), 111-115. <https://doi.org/10.1016/j.jseint.2021.09.014>